VATIS UPDATE

Waste Management

Vol. 5 No. 103 • Mar - Apr 2011
ISSN 0971-5665

Highlights

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UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific

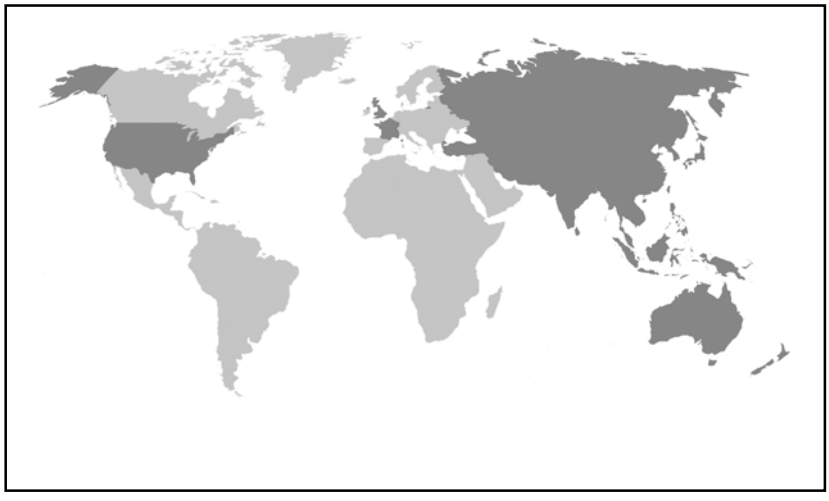
APCTT
ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY

giz

The **Asian and Pacific Centre for Transfer of Technology (APCTT)**, a subsidiary body of ESCAP, was established on 16 July 1977 with the objectives: to assist the members and associate members of ESCAP through strengthening their capabilities to develop and manage national innovation systems; develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region.

The Centre will achieve the above objectives by undertaking such functions as:

- Research and analysis of trends, conditions and opportunities;
- Advisory services;
- Dissemination of information and good practices;
- Networking and partnership with international organizations and key stakeholders; and
- Training of national personnel, particularly national scientists and policy analysts.



The shaded areas of the map indicate ESCAP members and associate members

Cover Photo

Air scrubber technology helps cut emissions from the plant of Tata Steel (See page 17)
(Credit: Tata Steel Ltd., India)

VATIS* Update Waste Management
is published 6 times a year to keep the readers up to date of most of the relevant and latest technological developments and events in the field of waste management. The Update is tailored to policy-makers, industries and technology transfer intermediaries.

Website: http://www.techmonitor.net

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This publication is supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Germany.

This publication has been issued without formal editing

*** Value Added Technology Information Service**

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Vol. 5 No. 103 Mar - Apr 2011

New ISO standard on environmental management

The International Organization for Standardization (ISO) has published a new standard to help organizations – the small and medium-sized enterprises (SMEs) in particular – use a phased approach to implement an environmental management system (EMS). Currently, organizations increasingly take into account environmental management requirements in their activities. However, even if they clearly see the benefits that they can derive, implementing an EMS is not always an easy task, especially for SMEs.

The work will now be made easier by ISO 14005:2010, Environmental management systems – Guidelines for the phased implementation of an environmental management system, including the use of environmental performance evaluation. The purpose of ISO 14005 is to provide guidance for organizations on the phased development, implementation, maintenance and improvement of an EMS in order to meet ISO 14001, which provides the requirements for an EMS. ISO 14005 also includes advice on the integration and use of environmental performance evaluation techniques. The model outlined in the standard was developed to help an organization implement an EMS in a flexible way, focusing on the organization's needs, while expanding the extent and scope of the system, through time, in line with the objectives of the organization and the resources available.

A phased approach offers several advantages:

- Users can see how the environmental improvements help reduce costs, improve community relations, assist in demonstrating compliance with legal and other requirements, as well as help live up to customer expectations;
- Users can readily evaluate how the time and money put into an EMS provides a return;
- Users can track the benefits of their EMS while they implement the system step by step, adding or expanding elements as they provide value to the organization; and
- Users can focus on the issues that are critical for them, their customers or supply chain.

Source: www.iso.org

The Philippines adopts ways to reduce pollution

The Philippines made its first step in coming up with an environment-friendly transport model for the nation that the government hopes will help reduce pollution. The distribution of the 20 Asian Development Bank (ADB)-funded electric tricycles or "e-trikes" in Mandaluyong City in Metro Manila, Philippines' capital, came a week after a lawmaker proposed banning the use of plastic bags in major establishments. In a statement, ADB's Principal Energy Specialist Mr. Sohail Hasnie said that every 20,000 e-trikes that are introduced to Manila's streets will save the 100,000 l/d of foreign fuel imports or about US$35 million annually. ADB said e-trikes are more sustainable and energy-efficient.

Smoke pollution is a serious issue in the country, especially as public transportation such as jeepneys and buses contribute a huge part in this pollution. Emissions from the transport sector currently represent 30 per cent of all pollution in the country, and approximately 80 per cent of air pollution in Metro Manila, says ADB. The e-trikes use lithium ion batteries, such as the ones that are commonly used in laptop computers and mobile phones. The batteries can be recharged about 2,000 times, unlike the lead-acid batteries used in older e-trike models that need to be replaced every two years, ADB stated. This means that the carbon footprint of e-trikes will be less than one quarter of the carbon dioxide emissions from petroleum-fuelled tricycles.

Source: www.china.org.cn

India issues new rule on plastic waste

The Ministry of Environment and Forests, India, recently notified the Plastic Waste (Management and Handling) Rules, 2011 to replace the earlier Recycled Plastics Manufacture and Usage Rules, 1999 (amended in 2003). The new legislation was brought out following detailed discussions and consultations with a wide spectrum of stakeholders including civil society, industry bodies, relevant central government ministries and state governments. "It is impractical and undesirable to impose a blanket ban on the use of plastic all over the country. The real challenge is to improve municipal solid waste management systems," stated the Minister for Environment and Forests, Mr. Jairam Ramesh.

Some of the salient features of the new legislation are:

- Ban on the use of plastic materials in sachets for storing, packing or selling gutkha (a powdery preparation of crushed areca nut, lime, tobacco, catechu, paraffin and sweet or savoury flavourings), tobacco and pan masala (a mixture of areca nut bits and many flavourings);
- Recycled carry bags must conform to specific BIS standards;
- Plastic carry bags – particularly bags that come in contact with foodstuffs, pharmaceuticals and drinking water – shall be either white or only

have those pigments and colorants that are in conformity with the bar prescribed by the Bureau of Indian Standards (BIS);

- Plastic carry bags shall not be less than 40 µm in thickness (under the earlier legislation, the minimum thickness was 20 µm);
- Carry bags can be made from compostable plastics provided they conform to BIS standards; and
- Foodstuffs must not be packed in recycled or compostable plastics.

One of the major provisions under the new legislation is the explicit recognition, for the first time, of the role of waste pickers. The new legislation requires municipal authorities to constructively engage agencies or groups working in waste management, including waste pickers.

Source: moef.nic.in

China mandates waste treatment plants in factories

In 2010, the Environment Protection Agency in China had checked production activities in villages, enterprises, and export processing zones (EPZs) and industrial zones (IZs) operating along Dong Nai, Nhue, Day, Han and Huong rivers. It had discovered 439 enterprises that were seriously polluting the environment. However, a recent appraisal has shown that 312 enterprises are no longer causing pollution and 127 of them are repairing their waste treatment plants.

According to the Ministry of Planning and Investments, there are 200 EPZs and IZs nationwide on a total area of 71,394 ha. While 173 EPZs and IZs are starting operations, only 105 EPZs and IZs have wastewater treatment plants. The remaining are in the process of constructing such plants. Some of the existing wastewater treatment plants in EPZs and IZs are ineffective, causing release of wastewater into the environment.

Source: en.www.info.vn

E-waste collection effort in Sri Lanka

An electronic waste (e-waste) collection day was held recently by the Metropolitan Group, in collaboration with the Central Environment Authority (CEA), in support of Sri Lankan efforts towards cleaning of e-waste in a responsible manner. On 7 April 2011, a large number of people arrived at the e-waste collection centre to hand over waste items varying from ink and toner cartridges to computers, televisions, VCD/DVD players, CDs, cameras, power packs, typewriters, printers, scanners, copiers, and many more workplace and household e-waste products. The event was attended by Mr. Anura Priyadharshana Yapa, the Environment Minister, and by Mr. Satoshi Kimura, President of Canon Singapore, Mr. J.J Ambani, Chairman of Metropolitan Group, and Dr. Charitha Herath, Chairman of CEA. More than 4 tonnes of e-waste were collected on this collection day.

Source: www.waste-management-world.com

Power from waste poised to take off

In Thailand, power generation from waste is expected to increase to 150 MW by end of 2011 from just 26.6 MW now, spurred by a government campaign to encourage local administrations to develop renewable energy. Mr. Narongsak Kamales, Governor of the Provincial Electricity Authority, said that more than 20 municipalities had shown interest in the plan, and nine among them have initiated action. All waste-to-energy projects are being operated under the country's very small power producer (VSPP) programme, which was initiated in 2002.

To expand the share of renewable resources in the nation's power generation from the current 8 per cent to 20 per cent by 2021, the government is offering the incentive of an adder tariff, a higher rate that state utilities pay for power from producers using renewable sources. The move is aimed at both slowing the growth of landfills nationwide and lowering emissions of methane – 20 times more potent than carbon dioxide in trapping heat in the atmosphere – from landfill waste.

Thailand has 93 landfills, each containing at least 300,000 tonnes of waste, said Mr. Sompong Tancharenphol, Chairman, Thailand Institute of Packaging and Recycling Management for Sustainable Environment (TIPMSE) and Vice-Chairman of the Federation of Thai Industries. A report from the Pollution Control Department showed that Thailand produced 15.1 million tonnes of all types of waste in 2009 – 42 per cent of it recyclable materials and 50 per cent decomposable organic compounds. It said that only 3.1 million tonnes of recyclable waste are recycled each year, while another 3.2 million tonnes are simply buried. TIPMSE said recycled waste was worth an estimated 20 billion baht per year, which could be doubled with sufficient recycling capability.

Source: www.bangkokpost.com

Viet Nam's waste recycling units use backward technology

Mr. Le Van Khoa, Director of Ho Chi Minh City's Waste Recycling Fund (Refu), Viet Nam, stated at a press conference on HCM City's Fourth Recycling Day in 2011 that almost all the waste recyclers in the city

do not meet the standards, except for one in Binh Chanh and another in Cu Chi District. Mr. Khoa said the heavy tax on production of plastic bags would be applied early next year when the law on environmental protection tax will come into force. HCM city has just four producers of self-decomposing bags, and they are having difficulty finding outlets for their recycled products. To make matters worse, there are no national standards for such bags. The city discharges 30 t/d of plastic bags at the moment. The city government is planning to develop a huge waste recycling complex on 100 ha in the outlying district of Cu Chi, but land clearance for the project is not yet complete, Mr. Khoa said.

Source: english.vietnamnet.vn

Market-friendly pollution control system in India

India's Ministry of Environment and Forests has introduced a market-friendly emission trading system that is expected to reduce cost of compliance, make regulatory environment more predictable and raise investment and growth. The trading mechanism will have a system of self-regulation among industrial units by putting a price on emission of pollutants. There will be a two-year pilot emission trading scheme, at an estimated cost of US$80.6 million, which will cover 1,000 industries, near metro areas in Gujarat, Tamil Nadu and Maharashtra.

Mr. Jairam Ramesh, the Environment Minister, said this initiative would convince market operators that the Ministry is not anti-market or anti-industry. Given that a market-based system will reduce the costs compliance, it will be easier in the long run to introduce new regulations that increase environmental quality. It will, therefore, pave the way for more strict and robust environmental regulations without restricting industrial growth. Under the new system, the state pollution control board will set a limit on the amount of categories of air pollutants that can be emitted on the basis of its desired concentration in the atmosphere. The state regulator then allocates to industrial units permits that stipulate acceptable level of emissions. The industrial units can trade these permits; those that exceed the set level will have to buy permits from those who manage the emissions below the cap. Pollution emissions will be measured in real time using continuous emissions monitoring.

Source: lite.epaper.timesofindia.com

Waste management ETF launched

Global X Funds, the United States-based provider of exchange traded funds (ETFs), has launched a Global X Waste Management ETF. The ETF is approximately evenly divided among the disposal of hazardous waste, non-hazardous waste and recycling sectors. "The Waste Management ETF provides relatively easy access to a global industry that continues to grow rapidly as the world's population and individual incomes expand along with the need to manage waste and recycle resources," said Global X Funds CEO Mr. Bruno del Ama. The Global X Waste Management ETF tracks the Solactive Global Waste Management Index, which tracks the price movements in shares of companies that are active in the hazardous waste, non-hazardous waste and recycling industries. As of 7 April 2011, the three largest components of the index were Stericycle Inc., Waste Management Inc. and Veolia Environnement SA.

Source: www.prnewswire.com

China targets lead battery contamination

The Chinese government has put lead battery factories as the top priority in its campaign to rectify the nation's heavy metal pollution. The Ministry of Environmental Protection, together with eight other government organs, will target specific sectors and regions based on inspections conducted in 2010 and ensure corrective measures are adopted to root out environmental hazards. Enterprises that fail to meet the environmental protection requirements will have their production halted, while those who have caused serious contaminations will be prosecuted.

Provinces, autonomous regions and municipalities are required to publish the list of lead battery-related enterprises within their jurisdiction by the end of July 2011 to receive public supervision. Meanwhile, the Environmental Protection Department of Jilin province in Northeast China is preparing to hold a series of inspections of pollution treatment facilities in 430 highly polluting industrial plants built on rivers such as Liaohe River, the Songhua River and their tributaries. The massive inspection is intended to prevent future spills, especially poisoning of heavy metals.

Source: www.china.org.cn

POPs-free initiative

This initiative of the Secretariat of Stockholm Convention aims to collect and disseminate information on products that are free of persistent organic pollutants (POPs) and on the availability of related alternatives and substitutes. For more information please contact:

Stockholm Convention Secretariat, Geneva, Switzerland
Tel.:+41 22 9178729
Fax: +41 22 917 80 98
E-mail: hshubber@pops.int

Green solvent helps solve foam waste problem

Recycling polystyrene (PS) food containers is an energy-intensive and costly process that involves washing the foamy plastic waste using a large amount of hot water. As a result, most post-consumer PS ends up in landfills. Switchable Solutions from Canada has come up with an alternative solution to recycle post-consumer PS such as Styrofoam. The solution involves dissolving the plastic in a special solvent, following which a low-heat filtering process removes food residue and other solid contaminants. When carbonated water is added to the dissolved plastic, the solvent reacts with the carbon dioxide (CO_2) in the water and releases the plastic to mix with the water. What is left behind is pure PS powder, which can be turned into new products.

"It is all done at room temperature," says Mr. Dominik Wechsler, Chief Product Scientist of the company. The solvent and water can be again separated after each batch, and reused later by simply bubbling air back into the mixture to remove the CO_2. The process uses much less energy compared with other solvents that must be manipulated with heat. A further benefit in using the green solvent is that it can be easily processed to become soluble in water or non-soluble in water depending on how much CO_2 is added or taken away. With organic solvents used in many industrial processes and applications, removing the solvent post-process is energy-intensive and results in a large volume of the solvent escaping as vapour, contributing to smog pollution. The new solvent is described as green chemistry at its best.

Source: www.thestar.com

Economic GRP recycling technology

A new energy-efficient milling technology enables the economic conversion of glass reinforced plastic (GRP) waste into batch feedstock suitable for recycling. This grinding technology developed by International Innovative Technology (IIT), the United Kingdom, combines low energy consumption with powerful grinding force in compact size. The energy efficiency of the new technology offers new opportunities for the fine grinding of GRP and other materials that were previously seen as waste.

The process involves GRP waste first being converted into flakes using shredding equipment. A secondary reduction is then carried out in an IIT m-series mill that converts the flakes into a fine powder of <100 µm size. Tests, and subsequent production runs, have shown that the inclusion of a percentage of this powdered material back into the primary batch for manufacture of new GRP products has no detrimental effect on the GRP in terms of strength, light transmission, light diffusion or durability. The modular, vertical mill is capable of grinding soft, medium and hard materials to 9.5 on Mohs scale, with 90 per cent being 45 µm and below. Compact and powerful, the centrifugal grinding mechanism the IIT mill is extremely efficient, with the vertical material flow path and special roller assembly ensuring that the force produced is translated into optimum grinding power. As a result, rather than relying on airflow (as in traditional systems) to carry the feed materials through the mill and into contact with the grinding media, the IIT mill utilizes natural centrifugal and gravitational forces to maximum effect.

Source: www.reinforcedplastics.com

Technology to recycle multilayer films on the anvil

While single-layer, flexible packaging film can be easily recycled at the end of its useful life, multilayer packaging is very difficult to recycle because it contains many different polymers. Polyflow Inc., the United States, is developing a technology that will recycle mixed, dirty plastic and rubber waste without sorting. The new process can even process metallized film. It also does not require metal screws or paper labels to be removed from the packaging before processing.

The process uses high-temperature anaerobic de-polymerization and chemical reactions to convert mixed waste polymers back into monomers that can be reused to make polymers. Major products of the process are styrene and its precursors, petroleum blend stock and other hydrocarbons. This technology can produce 0.7 t of light hydrocarbon liquid from 1 t of polymer feedstock. The company expects to have a full-size production plant built by 2011. At this stage in development, the concept carries processing costs that are about 10 per cent higher than those of a typical major petrochemical company that makes the same virgin products. The concept enjoys an economic advantage because of the cost of raw materials; waste plastic and rubber feedstock often is available locally in abundance and carries a low price tag.

Source: www.plastemart.com

Plastic and paper separator

India-based Doll Plast Machinery has introduced a plastic and paper (pulp) separator machine, which the company says can allow paper

mills to save 35-40 per cent of paper from mixed plastic and pulp waste. Another benefit is the ability to resell the plastic scrap recovered from the process. The machine is available in three different models – S25 that operates at 25 hp and the ability to process 60-70 kg/h, S50 operating at 50 hp and processing 125-150 kg/h and S100 operating at 100 hp and processes at 125-250 kg/h. *Contact: Doll Plast Machinery Inc., No. 44, Vaibhav Bunglows, Part 2, Near Sun-N-Step Club, Sola Road, Ahmedabad 61, Gujarat, India. Tel/ Fax: + 91 (79) 2748 2773; E-mail: dollplast@dollplast.com; Website: www.dollplast.com.*

Source: www.recyclingtoday.com

Building rooms with used plastic

A social entrepreneur in the Philippines has devised a method of using recycled plastic and glass bottles for construction. Mr. Illac Diaz, who heads a non-profit organization My Shelter Foundation, seeks innovative, sustainable, eco-friendly and low-cost solutions to fight climate change. The Foundation's sustainable construction method of recycling plastic bottles into building material has caught the attention of the architecture and construction industry in the country.

The Foundation drew inspiration for these schools from Spanish-style adobe churches and buildings that incorporated glass bottles in Turkey and Mexico – which have withstood the test of time. The process uses 1.5-2 l plastic bottles used to pack carbonated beverages. The bottles are filled with liquefied adobe and left to dry for 12 hours. Thereafter, the bottles are arranged like bricks, stacked neatly to form walls, with cement used to hold them in place and make the wall sturdy. In the wall, small holes and PVC pipes could be inserted between the bottle bricks to serve as air vents. When turned into bricks, the bottles made from polyethylene terephthalate (PET) are very stable. These PET bottle bricks were tested and found to be stronger than conventional hollow blocks, very durable, flexible and easily adaptable into conventional construction methods.

Source: www.deccanherald.com

Plastic turned into black gold

Agilyx, the United States, has come up with a system for turning plastic into synthetic crude oil. The plastic is shredded, heated and condensed into synthetic crude oil for selling to refineries. Using this process, 10 tonnes of discarded plastic can be converted into about 10,900 litres of oil per day. Agilyx uses a patented process involves a base system that consists of four primary vessels and associated secondary processing equipment. The process control is by means of a supervisory station that has touch screens and a graphical user interface.

Ground-up waste plastic is put into specially designed cartridges that are part of Agilyx's base system. The cartridges are placed in a large processing vessel called a plastic reclamation unit. Hot air is circulated around the cartridges, melting the plastic and turning it into a gas that is then pulled into a central condensing system, cooled and condensed into synthetic crude oil. Impurities are removed, and lightweight gases that do not condense are treated by an environmental control device and released into the air. The operation can be scaled up by combining multiple base systems together. The processing units share one common exhaust system to manage the hot air they produce.

Source: www.technewsworld.com

Plastic recycling process breakthrough

Just 12 per cent of plastic found in household plastics and packaging is currently processed in the United Kingdom. The vast varieties of plastics involved make it a difficult task for waste management companies to filter each type. Engineers from Warwick University have developed a ground-breaking process that can cope with every piece of plastic waste, and can even break down some polymers such as polystyrene back to its original monomers. The engineers have made a unit that uses pyrolysis (using heat in the absence of oxygen to decompose of materials) and a 'fluidized bed' reactor.

Source: safelecenvironmentalservices.co.uk

Equipment used in Agilyx's plastic-to-oil conversion process

Environment-friendly recycling of lead battery paste

A new recycling process developed by Dr. Kumar at the Department of Materials Science and Metallurgy, University of Cambridge, the United Kingdom, could transform the lead battery recycling industry. The process employs organic reagents to recycle the lead-bearing paste (with a high proportion of lead sulphates) from waste batteries into a form that can be used directly as the lead oxide precursor for manufacturing new lead battery paste. This method has considerable benefits over the high-temperature methods conventionally used to recycle lead battery paste into metallic lead. These include:

- Lower energy requirements;
- Lower emissions of toxic gas and dust;
- Lower capital equipment cost – the new process can be economic on large and small scales (>1,000 t/y of lead); and
- The product can be optimized for direct use as the precursor for manufacturing new lead battery paste.

Contact: Dr. Margaret Wilkinson, Cambridge Enterprise Ltd., University of Cambridge, Hauser Forum, 3 Charles Babbage Road, Cambridge CB3 0GT, United Kingdom. Tel: +44 (1223) 760 339; E-mail: Margaret.Wilkinson@enterprise.cam.ac.uk; Website: www.enterprise.cam.ac.uk.

Source: www.enterprise.cam.ac.uk

Recycling of discarded ruthenium precursors

In Japan, Tokyo Electron Ltd. and Tanaka Kikinzoku Kogyo K.K. have developed a recycling process for ruthenium precursors used in next-generation semiconductor miniaturization technology. Ruthenium precursors, which were up to now discarded, can now be collected, refined and reused without returning them to ruthenium metal. Tokyo Electron developed the recovery system that collects residue of the ruthenium precursor not deposited on the wafer, and Tanaka Kikinzoku Kogyo developed the process to refine and reuse the collected ruthenium precursors.

In semiconductor fabrication, there are challenges to scaling, such as improving the copper filling performance in a narrow interconnect. Tokyo Electron has proposed an improvement in copper filling performance by utilizing a ruthenium liner film with excellent adhesion and lower resistivity. For lowering overall cost and ensuring a stable supply of ruthenium precursors, the two companies agreed to jointly develop the recycling process. The process will save almost 20 per cent of ruthenium precursor cost and greatly lower the cost of consumables of the chemical vapour deposition process used. Further, an almost 30 per cent reduction in carbon dioxide emissions is expected utilizing the new recycling process. *Contact: Tokyo Electron Limited Headquarters, 2400 Grove Boulevard, Austin, TX 78741, United States of America. Tel: +1 (512) 424 1000; Fax: +1 (512) 424 1001.*

Source: www.itnews.it

New process for rare earths recycling

Rhodia, an international chemical company headquartered in France, has developed a new process for the recovery and separation of rare earths contained in used low-energy light bulbs. The result of a range of research programmes conducted by Rhodia for several years on the life cycle of its products, this original process for the recycling of luminescent powders opens up new environmental and economic prospects.

Used light bulbs are currently processed by specialized companies with a view to recycling the various components (such as glass, metal, plastics and mercury). The luminescent powders, which contain high concentrations of rare earths, are disposed of in landfills. The new process enables the powders to be recycled at two of Rhodia's plants in France. *Contact: Ms. Roxanne Diarra, Media Relations, Rhodia, 110, Esplanade Charles de Gaulle, La Défense 4, 92931 Paris La Défense Cedex, France. Tel: +33 (1) 5356 5962; E-mail: roxanne.diarra@eu.rhodia.com.*

Source: www.rhodia.com

Facility for flat panel display processing

A fully dedicated flat panel display (FPD) processing centre, the first such facility in the United Kingdom, was launched in Preston by the commercial recycling and waste management company Recycling Lives. At the FPD recycling centre, the disassembly process has been broken down into stages to increase the efficiency of handling. Preparatory studies conducted over four years have included comparisons between FPD and cathode ray tube (CRT) recycling. By comparing the two processes, the company was able to incorporate procedures from CRT recycling into the FPD recycling method. The result has been improvements in both speed and effectiveness for the FPD processing operation. The data and research on the operation has allowed Recycling Lives to develop and adopt best practices for FPD recycling. The company anticipates that its FPD line will be able to process up to 1,000 units/day at full capacity.

Flat panel display (FPD) processing centre at Recycling Lives

The new system also addresses the safety aspect of the process. When broken during manual disassembly, the lighting tubes display screens release toxic mercury vapours, and this raises challenges on the health and safety aspects of mercury recycling. The development of the FPD processing line involved significant investment into health and safety testing. The line includes sophisticated mercury analysing equipment and a specially designed mercury-safe dismantling room. In addition, the staff is provided with specialist protective equipment and training on safety aspects.

Source: www.recyclingtoday.com

New rare earth recycling technology

The electronics company Hitachi of Japan has developed an effective process for recycling rare earths from used electronic gadgets and appliances. The novel technique, scheduled for implementation by 2013, is expected to provide some 60 t/y of the valuable elements, or meet about 10 per cent of the entire Hitachi Group's requirement for rare earths.

At the centre of the recycling system is a new machine that can disassemble articles such as computer hard disks and extract rare earths from the specialized magnets inside. In the case of hard drives, one person can disassemble only about 12 by hand per hour, whereas the new machine can take apart 100 drives in the same time, recovering some 2 t/y of magnets. The next stage, developed in partnership with the University of Tokyo's Institute of Industrial Science, separates the rare earths from the other materials in the magnet without producing the toxic waste liquid inherent in conventional techniques.

Source: www.phoenixelectronicsrecycling.com

Sorting machine for pure metal fractions

The Combisense from TITECH AS, Norway, is a specialized high-end machine that can separate high-purity metal fractions from even the most difficult fractions in terms of composition, grain size and mix from mixed streams such as electrical and electronic waste (e-waste). This sorting device is designed to identify colours, shapes and metals from bulk solids. The high spatial resolution of the colour camera, along with precise colour measurement, enables sorting complex material streams of used electrical devices and recovery of non-ferrous metals with a high purity. The key features and benefits include:

- Stable colour identification with highest resolution;
- Latest LED illumination technology – very long-lasting and steady;
- Very precise separation behaviour also for fine grain; and
- Extremely fast pay-off period.

The identification technology of the TITECH Combisense consists of a sensor with increased sensitivity and a colour line scan camera with even higher resolution and colour selectivity. It collects multiple material characteristics at the same time. The information can be combined by efficient and unique digital image processing with precise location on a pixel level for precise identification of the different materials. The illumination unit has of state-of-the-art, liquid-cooled LED technology, enabling steady and reproducible sorting results. A new mechanical design provides for a higher endurance and robustness.

Sensor configurations can be: either a combination of a high resolution colour line scan camera plus an electromagnetic sensor with high sensitivity to gather information for sorting materials by colour, shape, brightness, size and conductivity; or a high resolution colour line scan camera to process fine metal granulates to produce mono fractions, like copper, of very high purity. *Contact: TITECH AS, Headquarters, Drengsrudhagen 2, Asker, Akershus 1385, Norway. Tel: +47 (66) 752 440; Fax: +47 (66) 799 111.*

Source: www.titech.com

Sunlight to remove contaminants in wastewater

At the Polytechnic School of Alcoy (EPSA), Spain, researchers led by Prof. Ana Maria Amat, have developed a new system that gets rid of contaminants – such as remnants of drugs, pesticides, etc. – found in water exiting from conventional wastewater treatment plants. The system is based on solar photocatalysis, a process that uses sunlight for water purification and noted for its profitability and low energy consumption.

According to Prof. Amat, in most cases, treatments used at present in conventional sewage wastewater treatment plants – both urban and industrial – are not able to remove all the residual contaminants (the amount being below 1 µg/l) such as analgesics, antibiotics, pesticides etc. The proposed system can significantly improve the quality of the water discharged from treatment plants. Furthermore, unlike other existing systems (such as the ones based on the use of membranes or ozone) to remove emerging contaminants, photocatalysis provides a fundamentally economic advantage and simplicity of the system. In this system, the only cost of energy incurred is for pumping water inside the plant. Besides, its maintenance is very simple, states Prof. Antonio Arques, a researcher at the Group of Advanced Oxidation Processes at EPSA.

Source: www.techberth.com

Recovering ethanol from wastewater

R3 Fusion Inc., the United States, has announced the availability of its commercial system for recovering ethanol from waste scrubber water. The system, called the Short Path Condensate Recovery (SPaCeR™), is designed to process 227 litres/min of scrubber waste generated from an ethanol plant with a capacity of 227 million litres per year. The technology allows ethanol producers to extract trace amounts of ethanol from carbon dioxide scrubber water and concentrate the water/ethanol mixture so that it can be introduced directly into standard distillation columns. The benefit to a typical ethanol facility is increased overall production capacity and recovery of millions of dollars worth of ethanol that would be otherwise lost.

The patent-pending SPaCeR technology was developed to address the increasing concerns about the supply of fresh water. According to R3 Fusion, less than 1 per cent of the planet's water is fresh water available for human use. Therefore, the company believes it is essential to reuse, recycle and/or remediate contaminated water and wastewater streams. *Contact: R3 Fusion Inc., 405 Jordan Road, Troy, New York, NY 12180, United States of America. E-mail: info@r3fusion.com.*

Source: domesticfuel.com

New technology for wastewater treatment

Researchers at Banaras Hindu University (BHU), India, have conducted a field experiment of a new technology for wastewater treatment. The ozone-based technology, developed by a group of scientists led by Prof. B.D. Tripathi, coordinator of BHU's Centre for Environmental Science and Technology (CEST), removes all organic contaminants from the wastewater and provides bacterial disinfection. The principle of this patent-pending process is that different concentrations of ozone gas are passed through the wastewater for different contact times to make it work as a strong oxidant or disinfectant. More than 95 per cent of the organic materials are degraded during this process. The technology has also demonstrated a bacterial disinfection of above 98 per cent.

Source: articles.timesofindia.indiatimes.com

Wastewater treatment system could also produce electricity

Researchers in the United Kingdom are hoping a low-cost wastewater treatment system that they devised for the developing world would also produce electricity. The multi-disciplinary team led by Glasgow University has received £1 million from the Engineering and Physical Sciences Research Council (EPSRC) to create a bacteria-based system for treating waste in areas on the outskirts of cities that have poor or no sewage facilities. The scientists will bioengineer bacteria to break down large amounts of solid waste using anaerobic digestion in a reactor based on existing technology used by distilleries and pharmaceutical companies. They hope to be able to capture the gas from the process to generate electricity. As the system will not produce other waste products, they also hope it could improve wastewater treatment in the developed world.

Researchers from Brighton, Ulster, Cranfield, Newcastle and Sheffield universities are participating in the project that is expected to take four years to produce a prototype system. Existing anaerobic systems are typically used to treat industrial wastewater with a low solid content. These expanded granular sludge bed (EGSB) reactors rely on the bacteria staying in the tank, but high-solid waste would push them

out. "Our hypothesis is that we can eco-engineer the bacteria so that they will stay in the system despite the fact that we'll be pumping high-solid wastewater through," states principal investigator Dr. Gavin Collins. Part of the challenge will be designing a practical system that will be socially and culturally acceptable for populations in the developing world.

Source: www.theengineer.co.uk

Waste plant to use sustainable sludge destruction

Eras Eco, an Irish waste treatment and recycling company, is to install AquaCritox, a new process for organic wet waste treatment. The AquaCritox technology from SCFI Group Limited, Ireland, uses supercritical water oxidation to destroy organic waste without generating hazardous emissions. The carbon-neutral technology is completely odourless, generates renewable energy and recovers valuable by-products, such as phosphorus and carbon dioxide, that can be resold. The plant will treat pharmaceutical waste, which previously needed to be thermally treated at high costs.

The heating part of the AquaCritox process

According to SCFI Chief Operating Officer Mr. David Kerr, "AquaCritox is a full destruction rather than reduction technology, offering a significant decrease in costs with none of the hazardous by-products associated with other destruction technologies." He adds that AquaCritox technology is environment- friendly, fast and safe, and produces more energy than it actually uses. As the reaction is rapid, it also means that the plants are small in actual size. *Contact: Mr. John O'Regan, CEO, SCFI Group Limited, Rubicon, CIT Campus, Cork, Ireland. Tel: + 353 (21) 4928 983; E-mail: info@scfi.eu.*

Source: www.edie.net

Recovering copper from electroplating wastewater

Scientists at the Key Lab of Marine Environmental Science and Ecology, China, have developed a lab-scale process that combines electrolysis (EL) and electrodialysis (ED) to treat copper-containing wastewater. The feasibility of such process for copper recovery as well as water reuse has been determined. The effects of three operating parameters – initial $Cu(2^{+})$ concentration, voltage and water flux – on the recovery of copper and water were investigated and optimized. The results have shown that about 82 per cent of copper could be recovered from high concentration wastewater (HCW, >400 mg/l) by EL, at the optimal conditions of voltage 2.5 V/cm and water flux 4 l/h. From low concentration wastewater (LCW, <200 mg/l), 50 per cent of diluted water could be recycled by ED, at the optimal conditions of voltage 40 V and water flux 4 l/h.

However, because of the limitation of energy consumption, treatment of LCW by EL and HCW by ED could not be carried out effectively, and the effluent water of EL and concentrated water of ED should be further treated before discharge. Therefore, the combination process of EL and ED was developed for the recovery of copper and water simultaneously from both HCW and LCW. The EL and ED process results showed that almost 99.5 per cent of copper and 100 per cent of water could be recovered, with the energy consumption of EL ~3 kWh/kg and ED ~2 kWh/m^3. Seamlessly integrating electron beam imaging (SEM)/energy dispersive X-ray spectroscopy (EDX) analysis showed that the purity of recovered copper was as high as 97.9 per cent. *Contact: The Key Lab of Marine Environmental Science and Ecology, Ministry of Education, Ocean University of China, Songling Road #238, Qingdao, Shandong Province 266100, China.*

Source: www.ncbi.nlm.nih.gov

Electrobiochemical process to remove water pollutants

In the United States, University of Utah researchers have developed a new concept in water treatment – an electrobiochemical reactor (EBR) in which a low electrical voltage is applied to micro-organisms to help them quickly and efficiently remove pollutants from mining, industrial and agricultural wastewater. The patented process replaces tonnes of chemicals with a small amount of electricity that feed microbes with electrons. Tests have shown that the electrons reduce the time that the microbes take to remove pollutants – such as mercury, selenium and arsenic – and significantly reduce the cost of wastewater clean-up. The research is now being used by INOTEC, a University of Utah start-up company.

In conventional wastewater treatment, microbes or chemicals alter or remove contaminants by adding or removing electrons. These electrons come from large excesses of nutrients and chemicals added to

the systems to adjust the reactor chemistry for microbial growth and contaminant removal. The EBR system overcomes this shortcoming by directly supplying excess electrons to the reactor and microbes using low voltage and no current, unlike other systems that provide large electrical currents. One volt supplies about one trillion trillion electrons, at a considerable savings and with greater efficiency. The electrons needed for a full-scale facility can easily be supplied by a small solar power grid.

Source: eponline.com

Oxidation to render toxic wastewaters biodegradable

A FENTOX plant in the chemical industry

Eisenmann AG, Germany, has developed a new process to render toxic wastewaters biodegradable. The patented FENTOX® process is based on the use of a mixture of hydrogen peroxide and iron II salts (acting as a catalyst) to oxidize organic substances in wastewater. The hydroxyl radicals created during the reaction detoxify bacteria-toxic pollutants, and render the pollutants completely oxidized or biodegradable for feeding into municipal sewage treatment plants or public water bodies. The multiple-step process chosen as a reactor cascade is quite economical and practical. The low oxidant consumption, which can be precisely adjusted to the individual case, and the significantly reduced sludge creation make the tried and tested multiple-step procedure low in investment costs and space requirement, and eases upgrading.

The FENTOX process is mainly used as a pre-treatment step for problematic wastewater from all kinds of chemical industries, such as for the pre-treatment of toxic wastewater from pesticide production. Also tried and tested is the process for chemical oxygen demand (COD) reduction in landfill leachate before entering a biological treatment.

Source: www.pollutionsolutions-online.com

Rubber latex factory wastewater treatment

Dr. W.M.G. Seneviratne at the Rubber Research Institute, Sri Lanka, has developed a cost-effective technology based on high-rate anaerobic process to add to the aerobic reactors installed in some rubber latex concentrate processing factories for wastewater treatment. The anaerobic digester contains systematically packed rubberized coir as the substrate for bacterial growth. Rubberized coir has high durability and high retention of microbes. A substantial level of organic removal is achieved at this stage of the treatment process. Submersible aeration or oxidation-ditch aeration appears to be quite effective in removing the rest of the organic pollutants after anaerobic digestion. Nitrogen and ammonia removal were found to be quite efficient as well.

Source: watertreatment-academy.org

Wastewater treatment reduces foaming and filaments

QM Environmental Services, the Netherlands, supplies a number of products that can be used to combat filament-induced foam types. The mechanism of many foam control products is to add hydrocarbon or silicone oils that are hydrophobic. These products work with surfactant-induced foams and polysaccharide-induced foams caused by nutrient deficiency. However, foaming caused by the filamentous bacteria *Nocardia* and *Microthrix* are quite different in nature and requires a defoamer that is chemically different. These filamentous foams are hydrophobic and are typically present when fats, oils, greases (FOG) and/or fatty acids are present at significant concentrations. Hydrocarbon and silicone oils could worsen the problem.

QM Environmental's MICROCAT-DF is a glycol-based defoamer optimized for microbial foam. The product helps break up the tangled filament mass in the foam and disperse the filaments to accelerate washout. If a slug of MICROCAT-DF is added to a well-mixed area of the aeration basin, the foam can be broken down in minutes. The defoamer works in aerobic and anaerobic digesters.

MICROCAT-DNTRF is a bioformula that, by effectively reducing FOG concentration, restricts the food the filaments have to grow. Generally, this will take a bit more time than when using MICROCAT-DF but the effect will be more lasting.

MICROCAT-XF reduces filamentous microbe populations, improves settling of sludge and reduces effluent suspended solids. The product contains a combination of aerobic and facultative anaerobic bacteria selected from nature for their ability to break down a broad range of substances in food processing and domestic wastes. It also has enzymes and other ingredients selected to destabilize the protein sheath protecting many filamentous forms.

Source: www.pollutionsolutions-online.com

Enhanced anaerobic bioremediation

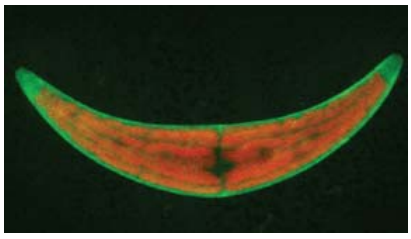
Tersus Environmental LLC from the United States offers an enhanced anaerobic bioremediation solution named iSOC®. This solution was used at a former Defence Property Disposal Office (DPDO) waste storage area. After injection of a hydrogen-releasing compound reduced the plume by 50 per cent, the hydrogen gas infusion system iSOC was installed at the DPDO waste storage area to maintain favourable conditions for anaerobic bacteria. By enhancing reductive dechlorination, solvent concentrations at the infusion wells were reduced by 93 per cent within six months.

Hydrogen gas infusion works well in combination with electron donors, such as emulsified vegetable oils (EVOs), and soluble substrates. It can be utilized as a supplemental hydrogen electron donor for recirculation and precondition waters used for bioaugmentation cultures. *Contact: Tersus Environmental LLC, 2510 Warren Avenue, Suite 3880, Cheyenne, Wyoming 82001 United States of America.*

Source: www.environmental-expert.com

Algal method for nuclear waste remediation

In the United States, researchers from Northwestern University and Argonne National Laboratory have an enhanced the understanding of a common freshwater alga and its remarkable ability to remove strontium from water. Insights into this mechanism ultimately could help scientists design methods to remove radioactive strontium from existing nuclear waste. The research is the first to show quantitatively how the



The alga Closterium moniliferum *that soaks up strontium*

alga *Closterium moniliferum*, one of the bright green algae often seen in ponds, sequesters strontium in the form of barium-strontium-sulphate crystals.

The crescent-shaped, single-celled alga studied by Dr. Derk Joester and his colleagues naturally makes biominerals, including non-radioactive strontium. It can also differentiate strontium from calcium – a rare feat. The researchers want to learn more about this selectivity because calcium is much more abundant than strontium in nuclear waste. By concentrating the radioactive strontium (Sr-90) in the form of solid crystals with very low solubility, the dangerous high-level waste can be isolated and dealt with separately.

"Using the algae for direct bioremediation of waste is one approach," said Dr. Joester, "but we also are looking at the basic mechanisms of how the algae sequester strontium, so we can engineer a more selective process for waste treatment. We want to isolate and concentrate in the crystals the most strontium possible." The algae's ability to separate strontium from calcium occurs when the crystals are formed inside the cells. It first soaks up barium, strontium and calcium from the environment. Strontium is then sequestered along with barium in the crystals, which remain in the cells, while the calcium is excreted from the cells. Barium must be present for the organisms to take up strontium.

Source: www.northwestern.edu

Genetically modified bacteria filter out toxic vapours

Organophosphorus pesticides, such as parathion and methyl parathion, are highly effective agrochemicals that, unfortunately, can accumulate in the environment and pose a risk to human health under some conditions. A team of researchers led by Mr. Junxin Liu of the Chinese Academy of Sciences in Beijing, China, has found that genetically modified bacteria could be used in air filters to extract pesticide vapours from polluted air.

The researchers have demonstrated average removal efficiencies of 95.2 per cent for parathion and 98.6 per cent for methyl parathion using a biofilter based on the engineered bacteria *E. coli* BL21. Optimization of the system might allow up to 100 per cent removal. The team explains that compared with conventional biofilters, their system is far more effective, especially in the initial stages of filtering. The pesticides are broken down to p-nitrophenol as well as nitrate and sulphate by-products. These by-products are then quickly "mineralized" by other naturally occurring microbes present in the biofilter.

Source: 7thspace.com

Safe solution for land remediation

A land remediation product 'safe' enough to eat will start a six-month field trial ahead of a launch in the United Kingdom. The product, much of which the owners are keeping under wraps, is a liquid that can be injected into the ground, thereby naturally degrading chemical contaminants through bioremediation. Trials will look at cleaning up chlorinated solvent contamination.

Creators Telluric Land Remediation believes the product will 'revolutionize' the way contaminated land is remediated. Mr. Ian James, Telluric Managing Director, said that the company is on track to develop a more sustainable and cost-effective product than other treatments that address chlorinated solvents in soil and groundwater. "It will meet environmental concerns about the wider impacts of the remediation process, such as generation of secondary waste products, power usage and potential emissions. Our lab trials have produced a physically stable compound of emulsified vegetable oil and various food-grade ingredients that are safe to handle and will promote enhanced anaerobic bioremediation," he added.

Source: www.edie.net

Microbial systems for anaerobic bioremediation

The Arizona Board of Regents, the United States, is patenting an invention relating to a consortium of micro-organisms that can be used to dehalogenate a chemical composition. The patent application also describes methods of use of the same for biomass production and for bioremediation. The invention particularly relates to a composition for dehalogenation of a sample that is contaminated with a halogenated chemical consisting of a microbial consortium of a mixture of isolated strains of *Chloroflexy, Firmicutes* and *Proteobacteria*. In some embodiments, the consortium also comprise one or more micro-organisms selected from the group consisting of *Spirochaetes, Delta proteobacteria, Beta proteobacteria, Gamaproteobacteria, Acetobacterium, Acidaminobacter, Sedimentibacter, Gracilibacter* and *Clostridium*. In still other embodiments the consortium comprises at least one strain from among *Trichlorobacter, Geobacter, Chlostridium* and *Dehalococcoides*.

A particular aspect of the invention relates to a microbial composition for concurrent dehalogenation of a mixture of halogenated ethenes and antimicrobials, comprising a non-naturally occurring dehalogenating microbial species, which contains of at least one 16S rDNA nucleic acid sequence that has more than 95 per cent identity to a nucleic acid sequence SEQ ID NO: 4, a nucleic acid sequence that when translated into protein has more than 80 per cent identity to a nucleic acid sequence consisting of SEQ ID NO: 1 , SEQ ID NO :2 or SEQ ID NO:3. *Contact: Arizona Board of Regents, 1475 North Scottsdale Road, Suite 200 Scottsdale, AZ 85257, United States of America.*

Source: www.wipo.int

Recovery of uranium and cobalt-60 from nuclear waste

Engineering acid and alkaline phosphatases (enzymes) into microbes for bioprecipitation (deposition on microbes) of heavy metals holds a promise for the development of appropriate technologies for recovery of uranium, cadmium and other radioactive metals from acidic, neutral and alkaline nuclear wastes, according to Dr. Shree Kumar Apte, a scientist at the Bhaba Atomic Research Centre (BARC), India. The use of some genetically engineered microorganisms offers an environmentally safe technology for bioremediation of radio-active waste.

Dr. Apte says the researchers have plans to extend their technology for removal of heavy metals from nickel-cadmium alkaline battery wastes. Sea water is another vast source of uranium though the concentration of metal in sea water is just 3 ppb (3 µg/l). These microbes can also be used for recovering heavy metals from sea water. However, BARC scientists are yet to work on microbial recovery procedures during an accidental situation remains to be explored, Dr. Apte stated. At Japan's Fukushima power plant, for example, radioactive waste – metals such as caesium, strontium and tellurium, and non-metals like iodine – allegedly polluted the sea water from one of the damaged reactors.

Source: ibnlive.in.com

Bioremediation of oil-contaminated sites

In the United States, a joint venture between Pro-Act Biotech and Eco-Solutions LLC has developed technology for the non-invasive and effective treatment of oil-polluted soil, water and waste. The self-powered, automatic OilClean™ bioremediation system optimizes treatment utilizing on-site and remote system management capabilities to monitor water quality in the treatment zone and to balance nutrients and dissolved oxygen. OilClean sensors continually measure water quality in the treatment zone and automatically distribute oil-eating microbes, nutrients and oxygen via a control panel to naturally degrade oil and restore oil-polluted ecosystems. The microbes continue to multiply until the oil is fully consumed and produce surfactants to disperse oil. Unlike dispersants, they will not harm the environment. Effective for pre-treatment of oil polluted waste such as booms, rags and plastics prior to landfill transfer, OilClean is also ideal for treatment in sensitive marsh and wetland environments and for ground water and soil remediation challenges.

Source: www.waterandwastewater.com

Capture of carbon dioxide at oil refinery

The CO_2 Capture Project (CCP) in Brazil has begun an oxy-combustion capture trial on a pilot-scale fluid catalytic cracking (FCC) unit – one of the highest carbon dioxide (CO_2) emitting units in a refinery. The test is expected to bring closer a more cost-effective technology capable of capturing up to 95 per cent of FCC CO_2 emissions – some 20-30 per cent of emissions from a typical refinery. The demonstration is taking place at a full burn FCC unit is expected to confirm the technical and economic viability of retrofitting an FCC unit for CO_2 capture through oxy-combustion. The project will test start-up and shut-down procedures, besides different operational conditions and process configurations, allowing the CCP partners to gain reliable data for scale-up.

CCP identified oxy-combustion as one of the most promising capture technologies to take forward for demonstration, from over 200 options evaluated. It initially conducted an economic assessment of oxy-firing and post-combustion amine absorption for CO_2 capture from the FCC regenerator. Both processes were able to achieve the required specifications and recovery level. While the post-combustion option had a lower capital cost, the lower operational costs for oxyfiring delivered a lower overall capture cost.

Source: www.pollutiononline.com

Coal ash to capture landfill gas for power generation

An energy generation scheme that makes use of domestic, plant and industrial wastes could help give new life to former landfill sites. The plan involves covering sites with fly-ash from coal power plants to prevent landfill gas leaking into the atmosphere and instead using it to turn garden waste into a nutrient-rich soil component called biochar.

Lichen Renewal based in the United Kingdom, the company behind this idea, is in advanced talks to regenerate two sites in England, turning them into land for agriculture and leisure while generating heat and electricity for local housing and retail developments. “The idea is to integrate waste strategy, methane emissions and renewable energy all into one,” explained Mr. Ranbir Gill, Founder and Director of Lichen Renewal. The gas collected from the capped landfills will generate electricity for the grid and heat that will dry out the plant waste, break it down into biochar via pyrolysis and create syngas, a mixture of carbon monoxide and hydrogen. Syngas can be used to produce more electricity and heat. The biochar will be combined with fly-ash, sewage sludge and other material to produce a fertile soil, while sequestering carbon effectively for centuries. “If we could cap 500 sites, that would stop the equivalent emissions of around 11-15 million tonnes of carbon per annum,” said Mr. Gill.

Source: www.theengineer.co.uk

Hydroxide crystals trap carbon dioxide

Layered double hydroxide (LDH) crystals can store carbon dioxide (CO_2) gas molecules between metal cation sheets (blue octahedra) at high temperatures, paving the way for improved emissions scrubbing. This breakthrough was reported by researchers led by Dr. Jizhong Luo at the A*STAR Institute of Chemical and Engineering Sciences in Singapore. By uncovering never-before-seen structural details of the high-temperature sorption material LDH, researchers have revealed a way to help mitigate CO_2 emissions from industrial exhaust gases.

LDHs, which have positively charged sheets of metal oxides interspersed with relatively open spaces holding anions and water molecules, feature large surfaces that can react with CO_2 and convert the gas into solid carbonate ions. When LDHs reach their adsorption limits, however, they must be regenerated by heating to temperatures high enough to induce an internal structural transformation – a process known as calcination that can eventually destabilize the metal oxide layers. Dr. Luo and his co-workers set out to understand the high-temperature performance of these adsorbents by adjusting the chemical composition of a typical magnesium–aluminium LDH. They replaced the triply charged aluminium cations with iron, gallium and manganese cations, and systematically observed how the substitutions affected structure, adsorption and thermal stability. The researchers found that the new cations influenced the physical properties of the LDH more than its chemical behaviour. They showed that distinct calcination temperatures for each LDH compound, as well as a unique quasi-amorphous phase, are key to maximizing CO_2 adsorption levels. The empirical ground-rules laid out by this study should help scientists select even better candidates for industrial CO_2 scrubbers.

Source: www.physorg.com

Technology for fine particulates control

In China, the Energy and Environmental Research Centre (EERC) and Fujian Longking Co. Ltd. have announced that they are moving forward with site selection as well as commercial design of the EERC-developed advanced fine particulate

control technology to improve global air quality. The EERC technology is said to be one of the most advanced technologies in the world for the removal of particulate emissions from the air. The technology has been licensed to Fujian Longking to demonstrate and commercially deploy it in China and the United States. EERC's hybrid technology removes fine particles from exhaust gases of coal-fired power plants, incinerators and mineral-processing facilities, as well as in the chemical and pharmaceutical industries. The technology integrates an electrostatic precipitator and a filter bag into the same housing, and the synergy between the two creates an efficient particulate matter collection system.

Source: www.pollutiononline.com

Scrubber technology helps cut emissions

In the United Kingdom, scrubber technology from ACWA Air helped Tata Steel Ltd. achieve a 40 per cent reduction in atmospheric emissions from one of its limestone kilns in Cumbria. To control kiln emissions, the four kilns were installed with a wet scrubber each. The scrubbers have had their shells refurbished several times over their lifetimes, due to the abrasive nature of their operating environment.

Recently, however, the scrubber on the No. 4 kiln was in need of refurbishment. ACWA Air recommended that, concurrent with the shell refurbishment, the existing process should be modified to integrate its well-proven Venturi slot tray technology into the process. This would be more effective than the existing scrubbing technology and achieve much higher collection efficiencies. Working within the constraints of the existing scrubber shell, ACWA Air was able to engineer a Venturi slot tray that provided lower emissions of dust, while making use of the existing scrubber vessel. The system did not impose any major changes to the operation of the lime kilns. Independent tests have proved that emissions from the modified kiln are consistently 40 per cent less than the values before the refurbishment.

Source: www.pollutionsolutions-online.com

Impregnating plastics with carbon dioxide

Researchers at the Fraunhofer Institute for Environmental, Safety and Energy Technology (UMSICHT) in Germany are impregnating plastics with compressed carbon dioxide (CO_2) in a process that could lead to novel applications ranging from coloured contact lenses to bacteria-resistant door handles. At a temperature of 30.1°C and a pressure of 73.8 bar, CO_2 goes into a supercritical state, giving the gas solvent-like properties. In this state, it can be introduced into polymers, or act as a 'carrier' in which dyes, additives, medical compounds and other substances can be dissolved. "At 170 bar, pigment in powder form dissolves completely in the CO_2 and then diffuses with the gas into the plastic," explains Mr. Manfred Renner, a scientist at UMSICHT. The whole process takes only a few minutes. When the container is opened, the gas escapes through the surface of the polymer but the pigment stays behind and cannot be subsequently removed.

In tests, the researchers have even managed to impregnate polycarbonate with nanoparticles that give it antibacterial properties. *Escherichia coli* bacteria, placed on the plastic's surface were destroyed completely – a useful function that could be applied to places like door handles. Tests conducted with silica and the anti-inflammatory ingredient flurbiprofen were also successful. Mr. Renner says that the process is suitable for impregnating partially crystalline and amorphous polymers such as thermoplastic elastomers, thermoplastic polyurethanes, polypropylene, polycarbonate and Nylon, but it cannot be applied to crystalline polymers. *Contact: Fraunhofer Institute for Environmental, Safety and Energy Technology, Osterfelder Straße 3, 46047 Oberhausen, Germany. Tel: +49 (208) 8598 1411; Fax: +49 (208) 8598 1290.*

Source: www.fraunhofer.de

New process for capturing carbon dioxide emissions

In the United States, a process developed by researchers at the Office of Fossil Energy's National Energy Technology Lab (NETL) improves the capture of carbon dioxide (CO_2) emissions from power plants. The Basic Immobilized Amine Sorbent (BIAS) process allows the capture of CO_2 from the flue or stack gas of power plants, preventing its release into the air. The technology reduces the costs and energy associated with more conventional scrubbing processes.

The BIAS process uses low-cost, regenerable, solid CO_2 sorbents in large-scale fossil fuel-burning power plants. An amine compound, composed of nitrogen and hydrogen, is treated to make it more selective and reactive towards CO_2. When combined with a porous solid support, the amine compound becomes a sorbent, which selectively reacts with CO_2 to extract it from the flue gas. The sorbent is then heated to release the CO_2 for storage, thereby refreshing the sorbent for reuse.

Source: www.greenenvironmentnews.com

Perspectives on Conducting Cost Analyses of CO_2 Capture Technologies

This report from the Integrated CO2 Network (ICO2N) is one of the many studies and research documents that ICO2N has prepared or participated in to advance the science, technology and deployment of carbon capture and storage (CCS) in Canada. It addresses the challenges arising when conducting a cost analysis of carbon dioxide capture technologies, and offers recommendations on how to ensure robust cost analyses of CCS technologies that are truly comparable and contrastable to other cost analyses.

Contact: Mr. Eric Beynon, ICO2N, C/O Suncor Energy Centre, 150-6th Avenue SW, Calgary, AB T2P 3E3, Canada. Tel: +1 (403) 2966 367; E-mail: ebeynon@ico2n.com; Website: www.ico2n.com.

Green Chemistry and Engineering: A Practical Design Approach

This book bridges the divide among bench chemistry, process design, engineering, environment, health, safety and life cycle considerations. Many concepts associated with greenness metrics, greener chemistry and engineering require cognitive skills such as evaluation, synthesis, analysis and application. To meet this need, the publication provides examples and practical exercises that help understand these concepts as applied to the industrial setting and to use the material in direct and indirect applications.

Green Chemistry for Environmental Remediation

The book presents an in-depth review of the emerging green face of multidimensional environmental chemistry. Topics such as green chemistry in industry, green energy – solar photons to fuels, green nanotechnology and sustainability, and green chemistry modelling address a wide array of issues encouraging the use of economical eco-friendly benign technologies. The book would be of interest to both environmentalists and chemists alike.

For the above two publications, contact: John Wiley & Sons (Asia) Pte. Ltd. Singapore Distribution Center, CWT Commodity Hub, 24 Penjuru Road, #08-01, Singapore 609128. Tel: +65 6302 9838; Fax: +65 6265 1782; E-mail: csd_ord@wiley.com.

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